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BLACKSTONE RIVER BASIN MILLBURY, MASSACHUSETTS



BRIERLY POND DAM MA 00143

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM



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DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION, CORPS OF ENGINEERS WALTHAM, MASS. 02154

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20. ABSTRACT (Cantinue on reverse side if necessary and identify by block mamber) Brierly Pond Dam consists of an earthfill dam which is part of West Main St. in Willbury Mass. The main dam is about 260 feet long, with a maximum height of 10 feet. The dike is about 225 feet long and 5 feet high. Brierly Pond Dam and Dike are considered to be in fair condition. An outflow test flood of 2,560 cfs will overtop the dam by about 2.4 feet.



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION. CORPS OF ENGINEERS 424 TRAPELO ROAD WALTHAM, MASSACHUSETTS 02154

REPLY TO ATTENTION OF:

NEDED

JAN 3 0 1979

Honorable Edward J. King Governor of the Commonwealth of Massachusetts State House Boston, Massachusetts 02133

Dear Governor King:

I am forwarding to you a copy of the Brierly Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Windle Industires, Inc., 65 Canal Street, Millbury, Massachusetts 02537.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

Incl As stated JOHN P. CHANDLER Colonel, Corps of Engineers

Division Engineer

BRIERLY POND DAM MA 00143

BLACKSTONE RIVER BASIN MILLBURY, MASSACHUSETTS

PHASE I - INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM



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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00143

Name of Dam: Brierly Pond

Town: Millbury

County and State: Worcester County, Massachusetts

Stream: Singletary Brook - Tributary of the Blackstone

River

Date of Inspection: August 23, 1978

Brierly Pond Dam consists of an earthfill dam which is part of West Main Street, Millbury, Massachusetts. An earthfill dike section is located at the northeast end of the pond 600 feet from the main dam. The age of the structures is unknown. The main dam is about 260 feet long, with a maximum height of 10 feet. The dike is about 225 feet long and 5 feet high.

There are two regulating outlets at the pond. One is a U-shaped concrete structure extending from the upstream toe of the dam. This outlet has a submerged 4-foot-square wooden slide gate with an invert at elevation (El) 511.9. The second outlet is located at the dike, and consists of a 4-foot-wide wooden slide gate and stone outlet channel. The invert of the outlet is at El 512.5. When the gate is open, water flows directly into the outlet channel. When the pond level exceeds El 516.3, and the gate is closed, the top of the gate serves as an overflow weir leading to the outlet channel. Overflow can also be controlled by flashboards on this gate. There is no other spillway at this site other than flow over the wooden slide gate.

The dam and dike at Brierly Pond were neither designed nor constructed according to current approved state-of-the-art procedures. Based upon the visual inspection at the site, the lack of engineering data,

and little evidence of operational or maintenance procedures, it was concluded that there are deficiencies that must be corrected to assure their continued performance. Generally, Brierly Pond dam and dike are considered to be in fair condition. Because of the potential danger to a few lives and the limited property development in the area, the dam has been placed in the "significant" hazard category.

The following visible signs of distress were noted at the site: erosion and insufficient riprap on the upstream face of the dam; the lack of permanently-installed equipment for opening the gate at the low-level intake; leakage around the closed gate; seepage in the tailrace downstream of the dam; and overgrowth of vegetation on the dam, the dike, and over the outlet channel.

Hydraulic analyses indicate that the opened outlet at the dike can discharge a flow of 180 cubic feet per second (cfs) when the water surface is at El 519.0, which is the lowest point on the dike. If the dike outlet gate is not opened, the discharge is 48 cfs at pond El 519.

An outflow test flood of 2,560 cfs (derived from one-half the probable maximum flood) will overtop the dam by about 2.4 feet. The outlet even when fully opened is inadequate as a spillway because it can discharge only 7 percent of the test flood. In the event of overtopping, complete failure of the main dam is unlikely, although local breaching and severe flooding is a possibility. Complete failure of the dike is possible during overtopping.

It is recommended that the Owner employ a qualified consultant to conduct a more detailed hydraulic and hydrologic investigation to design an adequate spillway. It is also recommended that the Owner construct a permanent mechanical operator for opening the gate at the outlet at the dam; repair the riprap on the upstream face of the dam; repair the stone masonry on the approach channel to the spillway; and clear the trees and brush from all structures. The Owner should also implement a systematic program of maintenance inspections.

The above recommendations and remedial measures should be implemented by the Owner within a period of 2 years after receipt of this Phase I Inspection Report. An alternative to these recommendations would be draining the pond and breaching or removing the dike or dam.



Edward M. Greco, P.E. Project Manager

Metcalf & Eddy, Inc.

Connecticut Registration No. 08365

Approved by:

Stephen L. Bishop, P.E.

Vice President

Metcalf & Eddy, Inc.

Massachusetts Registration No. 19703

This Phase I Inspection Report on Brierly Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

RICHARD F. DOHERTY, MEMBER

Water Control Branch Engineering Division

JOSEPH A. MCELROY, MEMBER

Foundation "& Materials Branch

oseph Q. Mc Elroy

Engineering Division

CARNEY M. TERZIAN, CHAIRMAN

Chief, Structural Section

Design Branch

Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR

Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrology and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

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OVERVIEW BRIERLY POND DAM MILLBURY, MASSACHUSETTS



UPSTREAM VIEW OF MAIN DAM

Location and Direction of Photographs Shown on Figure in Appendix B



NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIERLY POND

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Metcalf & Eddy, Inc. under a letter of July 28, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0306 has been assigned by the Corps of Engineers for this work.

b. Purpose

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
- (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location. The dam is located on Singletary Brook, a tributary of the Blackstone River, in the Town of Millbury, Worcester County, Massachusetts (see location plan).
- Description of Dam and Appurtenances. are two impoundment structures on Brierly Pond: an earthfill dam on the east side that forms part of West Main Street; and an earthfill dike at the northeast end of the pond, about 200 feet west of West Main Street (see location map, and plan of dam, and dike Figures B-1 and B-2). The dam is about 260 feet long with a maximum height of 10 feet. The crest of the dam, which is the paved road, is generally about 33 feet wide but increases to 100 feet wide at the south abutment, where Sutton Road forks to the south from West Main Street. elevation (E1) of the crest varies from 518.9 to 520.7. On the upstream slope of the dam there was originally a vertical stone wall two to three feet high. The wall has collapsed in many areas, and is overgrown with weeds. There is a small sandy beach near the south abutment, and beyond that an area of the pond has been filled for parking. The downstream slope of the dam (the east side of West Main Street) is a vertical concrete wall, and immediately beyond that is a three-story brick building, formerly the mill that used the water from the pond.

A low level outlet (outlet "B" on Figure B-1) is located at the dam about 100 feet south of the north abutment. The structure consists of a U-shaped concrete headwall with a 4-foot square submerged wooden slide gate. The invert of the gate is at El 511.9. This outlet is inoperative because there is no permanent mechanical operator at the gate. The outlet pipe reportedly enters the mill at the downstream face of the dam.

In addition to the low level outlet, there is a high-level service intake located about 30 feet offshore from the outlet ("C" on Figure B-1). The structure is a 6-foot-square concrete box, and the intake provided water to run the wheel at the mill. There is no access walk to the intake. Since the penstock has reportedly been filled in with concrete, this intake is inoperative.

The dike at Brierly Pond is about 225 feet long and about 5 feet high (see Figure B-2, Plan of Dike and Outlet). The crest of the dike is generally 13 feet wide north of the spillway. The elevation of the grass-covered crest varies from 519.5 to 521.2. The upstream slope is approximately 2:1 (horizontal to vertical) and covered with riprap. The downstream slope varies from 3:1 at the northern section of the dike to almost 6:1 at the southern section. The downstream face is covered with grass, and slopes into the backyards of two abutting residences.

There is no spillway at the dam other than a second low-level outlet (Outlet "A") located near the south end of the dike. The structure consists of an approach channel bounded by 2-foot thick mortared stone masonry and concrete sidewalls; a 4-foot-wide wooden slide gate operated by a rack and pinion mechanism, and a dry stone masonry outlet channel. gate stem is accessible by a wooden walkway built across the outlet channel. invert of the outlet is at El 512.5. When the gate is closed, water can flow directly into the outlet channel. When the gate is lowered, water above El 516.3 can flow over the top of the gate and enter the same channel. Flashboards can be added above the gate to increase the storage capacity of the pond.

The outlet channel is 190 feet long and decreases in height and width from 5.3 by 4 feet at the gate to 3.7 by 3.2 feet at the stone box culvert under West Main Road. The channel is straight, and has vertical sidewalls for most of its length. The slope of the channel is approximately 5.5 percent. The

- outlet end of the culvert is located east of West Main Street and is 3 feet wide and 2.8 feet high.
- c. Size Classification. Brierly Pond Dam is classified in the "small category since it has a maximum height of 10 feet and a maximum storage capacity of 135 acre-feet.
- Hazard Classification. The mill building that formerly used the pond is now used for storage and light industry, and is located immediately downstream of the dam. Failure of the dam could cause considerable damage to West Main Street and the building, before the flood water entered the former Mayo Pond basin. Failure of the dike could result in extensive property damage and possible loss of life in about five homes abutting the downstream toe of the dike. The height of the flood wave due to dike failure would be on the order of 2 to 3 feet. In both cases, it is likely that the dry Mayo Pond basin would reduce the impact of a dam or dike failure on Bramanville, located less than 1,500 feet downstream of the dike. For this reason, the dike and dam at Brierly Pond has been classified in the "significant" category.
- e. Ownership. The dam and dike are presently owned by Windle Industries, Inc., 65 Canal Street, Millbury, Massachusetts, 02537 (telephone 617-865-4461). A representative of the company granted permission to enter the property and inspect the dam.
- f. Operator. Windle Industries currently operates the flashboards at the spillway, and the outlet gate (B) at the dam.
- g. Purpose of the Dam. The dam and dike were constructed sometime prior to 1924 (the first recorded inspection date) by the West End Thread Company Mill No. 1. The dam was used to store water for mill processes including dye works and power for the water wheel. In 1944 the dam became the property of the Linen Thread Company, Inc., in Millbury. The thread company sold the dam to the Winfred W. Windle Company (wool processing) in 1948, but

apparently they retained the water rights and the right to enter and repair the dam. In 1955 W.W. Windle granted water rights to the Worcester Brass and Electroplating Corporation, who contracted for 50,000 gallons per day to their mill. The mill on West Main Street is no longer in operation and the intakes (B and C) are closed or blocked. The pond is presently used for recreation by the few abutting residents near the dike, and there is a small beach near the south abutment of the dam.

h. Design and Construction History. There are no plans available for the original dam or for any subsequent repairs. The present owner provided no information on the design and construction history of the dam. Early inspection reports on file at the Worcester County Commissioner's office and interviews with local residents provided some background information for both the dam and the dike.

In the early history of the dam, most of the area on West Main Street from north of the mill to south of the fork at Sutton Road was reported to be swamp land that had been filled in.

In 1925 the concrete wall at the downstream side of the dam was new, the conduit to the mill was a 48-inch diameter pipe, and the water wheel, a size 6, was rated at 60 horsepower. The 1939 report states that the spillway (i.e., the outlet A) was in good condition, and describes the concrete intake structure for the mill. According to the sketch, the gate was 58 inches square, and water flowed through the gate and down into a 65-inch diameter stone culvert under the roadway. The gate was operated by a rack and pinion mechanism. 1940 the spillway was rated in fair condition, and there were no flashboards at the time of the inspection (December). The inspector reported that the spillway was too small and that the gate should be kept open to keep the pond at a lower level.

A 1963 inspection report describes a diversion channel located about 100 feet below the slide gate at outlet A. This channel has about

a 3- by 5-foot opening and is used to divert some of the outlet flow to a community cesspool. Small leaks were reported at the spillway, and three large leaks at the diversion channel outlet. At the main dam it was recommended that the wood timbers on the gate be renewed, and the amount of freeboard for the dam be increased.

Through interviews with local residents it was learned that repairs were made to the outlet conduit walls and gate timbers in 1970. Also, the penstock in the waterwheel intake (C) was filled in with concrete about 3 years ago.

i. Normal Operational Procedures. There are no operational procedures at this dam. The gate at Outlet B has not been operated in a number of years. The Owner removes the flashboards from the slide gate at the dike in the late summer, apparently to provide extra storage in the pond in the event of flooding from seasonal storms.

1.3 Pertinent Data

- a. Drainage Area. The approximately 2,844-acre drainage area (4.4 square miles) above Briely Pond includes seven ponds in the Merrill Pond State Forest and several other mill ponds. Singletary Pond is the largest and comprises 12 percent of the drainage area. Singletary Pond Dam is also owned by Windle Industries. The drainage area is generally sparsely developed and consists of forest and farmland. The most heavily populated areas are the lake front properties along Singletary Pond. Two high-tension lines and a buried pipeline cross the drainage area south of Singletary Pond.
- b. Discharge at the Dam Site. Water discharges at the dike into the stone-lined channel that discharges east of West Main Street. There the flow joins a tributary of Singletary Brook which flows through the former Mayo Pond. Mayo Pond was a mill pond, and although the mill and dam are still standing, the pond has been drained. Singletary Brook flows north under Burbank Street through two 6- by 6-foot box culverts and into low, open land until it flows

under Route 140. The brook flows on the edge of a more heavily populated area of Millbury for the remaining 1,200 feet to the Blackstone River.

Water flowing through outlet B at the dam enters the mill, then apparently discharges into an earth tailrace below the building, and into Singletary Brook, also at Mayo Pond.

Hydraulic analyses indicate that, when opened, the outlet works (A) at the dike can discharge 180 cfs when the water surface is at El 519, which is the lowest point on the dam.

An outflow test flood of 2,560 cfs (one-half the probable maximum flood) will overtop the dam by 2.4 feet. The outlet, when fully opened, has the capacity to discharge only 7 percent of this flow, and with the gate closed the discharge is negligible, meaning that almost the entire flow will be over the crests of the dam and dike.

The maximum flood which has occurred at the dam site is unknown, although residents recall that flooding on Beach Street (north of the dike) has occurred in the past.

There is no longer any flow through Outlet B at the dam.

- c. Elevation (feet above MSL (Mean Sea Level)).

 A benchmark elevation of 517.0 at the water surface was estimated from a United States Geological Survey (USGS) to ographic map.
 - (1) Top dam: Main Dam: 519.0 to 520.7 Dike: 519.5 to 521.2
 - (2) Test flood pool: 521.4
 - (3) Design surcharge (original design): unknown
 - (4) Full flood control pool: Not Applicable (N/A)
 - (5) Recreation pool: 516.3, top of slide gate

- (6) Spillway crest (top of slide gate): 516.3
- (7) Upstream portal invert diversion tunnel: N/A
- (8) Stream bed at dike (outlet channel): 512.3
- (9) Maximum tailwater: None

d. Reservoir

- (1) Length of maximum pool: 1,800 feet
- (2) Length of recreation pool: 1,800 feet
- (3) Length of flood control pool: N/A

e. Storage (acre-feet)

- (1) Test flood surcharge: 50 at El 521.4
- (2) Top of dam: 135
- (3) Flood control pool: N/A
- (4) Recreation pool: 85 (approximate)
- (5) Spillway Crest: 85

f. Reservoir Surface (acres)

- *(1) Top dam: 17
- *(2) Maximum pool: 17
 - (3) Flood-control pool: N/A
 - (4) Recreation pool: 17
 - (5) Spillway crest: 17

^{*}Based on the assumption that the surface area will not significantly increase with changes in reservoir elevation from 516.3 to 519.0.

g. Dam

- (1) Type: Main dam: earthfill Dike: earthfill
- (2) Length: Main dam: 260 feet Dike: 225 feet
- (3) Height: Main dam: 10 feet maximum Dike: 5 foot maximum
- (4) Top width: Main dam: 33 feet Dike: 13 feet

Dike - Upstream: 2:1
Downstream: 3:1

- (6) Zoning: Unknown
- (7) Impervious core: Unknown
- (8) Cutoff: Unknown
- (9) Grout curtain: Unknown
- i. Spillway. (No spillway at this site other than Outlet A)
 - (1) Type: sharp-crested weir flashboards over outlet gate
 - (2) Length of weir: 5.45 feet
 - (3) Crest elevation: 516.3 (top of gate)
 - (4) Gates: one 48-inch square wooden slide gate
 - (5) Upstream Channel: Stone masonry and concrete walls on approach channel

- (6) Downstream Channel: Stone masonry channel with vertical walls, 4 feet wide, 5.3 feet deep at gate, to 3.2 feet wide, 3.7 feet deep. Open channel is 191 feet long, then stone culvert under road. Outlet is 3 feet wide and 2.8 feet high.
- j. Regulating Outlets. There are two regulating outlets at Brierly Pond. One is the slide gate (Outlet A) at the dike which when opened will allow flow down to El 512.5. There are keyways for 5.5-foot flashboards above the gate in the spillway. Shortly before the inspection two 6-or 7-inch boards were removed by the Owner. Water is presently flowing over the gate.

The second outlet, B, is located on the main dam. This gate is closed, and there is no permanent mechanism for opening it. According to a local resident, the gate was last opened with the aid of a pulley system mounted on a tripod on top of the intake structure.

SECTION 2

ENGINEERING DATA

2.1 General. There are no plans, specifications, or computations available from the Owner, State, or County offices relative to the design and construction of this dam. The only data available for this evaluation were visual observations made during inspection, review of previous inspection reports, and conversations with local residents, and State and County agencies.

We acknowledge the assistance and cooperation of personnel of the Massachusetts Department of Public Works: Messrs. Willis Regan and Raymond Rochford, and of the Massachusetts Department of Environmental Quality Engineering, Division of Waterways: Messrs. John J. Hannon and Joseph Iagallo.

Also, we acknowledge the cooperation and assistance of personnel from the Worcester County Engineer's Office: Messrs. John O'Toole, Joseph Brazauskas, and Mr. Wallace Lindquist - recently retired from county service.

Mr. Larry Stockwell, and Mr. William Grout, long-time residents of the Brierly Pond area, provided background history on the pond and mills.

- 2.2 Construction Records. There are no construction records available.
- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the elevation of the pool or rainfall at the dam site.

2.4 Evaluation

- a. Availability. Due to the age of this dam, there is no engineering data available.
- b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based

primarily on visual inspection, past performance history and engineering judgment.

c. Validity. The limited engineering data available is valid.

SECTION 3

VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I Inspection of the dam and dike at Brierly Pond was performed on August 23, 1978. A copy of the inspection check list is in Appendix A. Previous inspections of this dam have been made by others since 1924. A partial listing of these inspections is in Appendix B. Copies of the 1972 inspection reports by the Massachusetts Department of Public Works for both the dam and the dike are also included in Appendix B.
- b. Dam. The earthfill dam, which forms part of West Main Street, is in generally good condition. The paved crest is level with no cracks or depressions on the surface. The upstream slope is covered with weeds and only partially protected by scattered riprap 1.5 to 2.5 feet in size. Apparently there was once a short vertical stone wall at the top of the slope but the wall has deteriorated in places to a pile of rubble at the toe. The three-story brick building situated on the downstream slope of the dam is separated from the road by a 4-foot-wide, 10-foot-deep concrete channel. This channel is partially filled with water.

The earth dike, which is located about 600 feet from the main dam, is in good condition. The crest and the downstream face are covered with grass. Since the downstream slope serves as a back yard for two residences, the area is very well maintained. There are trees and shrubs growing on the upstream side of the crest, partially hiding the low stone wall on the shore.

c. Appurtenant Structures. Outlet A, at the dike, is in fair condition. There are patches of mortar and concrete missing from the training walls, and a few large diameter (1 to 2 foot) trees adjacent to the approach. The floor of the approach and discharge channel is submerged, but appear to be paved with stone.

There is minor spalling and erosion of concrete in the vicinity of the gate, but the gate appears to be in good condition. It is operable by a rack and pinion mechanism hung between timbers. The mechanism is accessible by means of a wooden walkway which crosses the outlet channel. The railing on the walkway is very loose. There is a keyway for flashboards to be added above the gate, but the flashboards had been removed that week by the Owner.

The stone masonry of the narrow outlet channel is in good to fair condition; some of the mortar and a few stones are missing at the base of the sidewalls. There are numerous trees growing on the banks of the channel, and in some places it is completely hidden by brush. The open channel ends at West Main Street and the inlet to the stone box culvert is obscured by vegetation. The outlet downstream of the street is in a stone masonry retaining wall. This area near the road is completely overgrown with trees.

Outlet B at the main dam is in fair condition. The concrete is spalling, especially at the water line. The slide gate is closed, and there is no permanent gate-opening mechanism in place. Water can be heard running inside the structure, suggesting that the gate leaks.

The tailrace downstream of the mill building is filled with brush and debris, and there is evidence of seepage.

The offshore service intake C is reportedly blocked with concrete and inoperable. There is no approach bridge to this structure.

d. Reservoir Area. At the present time light residential and commercial development is limited to the north and east sides of Brierly Pond. In addition, a small land-clearing operation is in progress on the northwest side of the pond, opposite the dike. The remainder of the area west of the pond is hilly farm and woodland.

- e. Downstream Channel. Discharge from the tailrace downstream from the mill, as well as from
 the stone box culvert below outlet A, enters
 Singletary Brook in the former basin for Mayo
 Pond. The mill building and dam at Mayo Pond
 are still standing, although in a deteriorating
 state, and the outlet and penstock are open.
 Below the mill Singletary Brook continues in a
 natural channel to the Blackstone River, about
 4,500 feet downstream, and just south of
 Millbury center.
- Evaluation. Although the dam and dike appear to be in good condition, the condition of the upstream slope of the dam and the leaking intake are signs of neglect. It is evident that these structures are not adequately maintained. Recommended measures to improve these conditions are stated in Section 7.3.

SECTION 4

OPERATING PROCEDURES

- 4.1 Procedures. There are no regular operating procedures at this dam. It is reported that the Owner regulates the storage in the pond seasonally by adjusting the number of flashboards at the outlet gate.
- Maintenance of Dam. The crest of the main dam is a paved town road and is maintained by high-way department personnel. The upstream slope of the dam has deteriorated, judging by the condition of the stone wall on the upstream face and the accumulation of debris and vegetation. The dike crest and downstream slope appear to be maintained by the residents of the abutting property, but the upstream face is overgrown with brush.
- Maintenance of Operating Facilities. The service intake structure C at the main dam was blocked with concrete by the Owner. The gate on the low-level outlet B appears to be leaking. Apparently the Owner has not used it for about 3 years, as there is no permanent operating mechanism. There is no known maintenance procedure for Outlet A.
- 4.4 Description of Any Warning System in Effect.
 There are no warning systems in effect at this dam.
- Evaluation. There are no regular operational or warning systems in effect at Brierly Pond Dam, and the maintenance is inadequate. This is extremely undesirable, considering the dam is in the "significant" hazard category. A program of operation and maintenance for this dam should be implemented as recommended in Section 7.3.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

The probable maximum flood (PMF) Design Data. rate was determined to be 1,200 cfs per square mile. This calculation is based on an average drainage area slope of 3 percent, the pondplus-swamp area to drainage area ratio of 19 percent, and the U.S. Army Corps of Engineers' Flow Rates (dated December 1977). Applying one-half the PMF to the 4.44 square miles of drainage area results in a calculated peak flood flow of 2,664 cfs as the inflow test flood. By adjusting the inflow test flood for surcharge storage, the maximum discharge rate was established as 2,560 cfs (577 cfs per square mile) with the water surface at El. 521.4.

For the peak outflow flood, the depth of flow over the crest at a minimum elevation of 519+ is calculated to be 2.4 feet with a unit flow of 9.9 cfs per foot of width. Where flow becomes critical, a critical depth of 1.5 feet will occur with a critical velocity of 6.8 feet per second. Hydraulic analyses indicate that outlet A at the dike, when fully opened, can discharge a flow of 180 cfs with the surface of the water at El. 519.0, which is the low point on the dam. This outlet, which also serves as a spillway, is inadequate since it can only discharge 7 percent of the test flood. Flood flow will also occur in a low, broad swale at the northern end of the pond. The swale is roughly 100 feet wide and about a foot higher than the normal pond level. During large storm flows this area would act as an emergency spillway, conducting discharge down Beach Street into Bramanville.

b. Experience Data. Hydraulic records are not available for this dam, however, residents recall some local flooding over the road at

the south abutment of the dam during the 1938 storm, and also in the natural swale during the 1955 floods.

- c. Visual Observations. At the time of the inspection the flashboards had been removed from Outlet A but the gate was closed and water was flowing over the top into the outlet channel. The gate and channel are inadequately sized considering that presently it is the only operable outlet at the pond and there is no spillway. Outlet B at the dam, although closed, is leaking. With no permanent mechanism for operating the gate the structure is useless for emergencies.
- d. Overtopping Potential. As noted previously, overtopping of the dam and dike is expected under the test flood. In addition, hydraulic computations show that the dike would be overtopped even with a 45 percent reduction in test flood outflows as a result of available storage at Singletary Pond. Failure of the dike would produce a flood flow of 570 cfs, with a resulting flood wave height of 2 to 3 feet. Failure of the dam during a peak flood would produce initial outflow on the order of 2,780 cfs. The volume from Brierly Pond could add 8 feet of water to the Mayo Pond basin.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. The evaluation of the stability of Brierly Pond Dam is based on the visual inspection conducted on August 23, 1978. As discussed in Section 3, Visual Inspection, the embankments of the dam and dike are generally in good condition, and not considered a hazard. However, the small size of the outlet at the dike, and the lack of a permanent operating mechanism at Outlet B at the dam indicate a possibly hazardous situation.
- b. Design and Construction Data. There are no plans, specifications or computations available on the design, construction or repair of this dam from the Owner, County, or State offices. Furthermore, information does not appear to exist on the type, shear strength, and permeability of the soil and/or rock materials of the embankment. The West Main Street highway embankment is probably of local sand and gravel fill without any type of core or cut-off wall.
- c. Operating Records. There is no evidence that instrumentation of any type was ever installed in Brierly Pond Dam. The performance of this dam under prior loading can only be inferred by physical evidence at the site.
- d. Post-Construction Changes. There are no asbuilt drawings available for Erierly Pond Dam. There is no information available on the type of conduit or the location of the outlets to the mill.
- e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with Phase I "Recommended Guidelines" does not warrant seismic analyses.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

Condition. Brierly Pond Dam was neither designed nor constructed according to current state-of-the-art procedures. Based upon the visual inspection of the site, the lack of engineering data, operational or maintenance information, there are deficiencies which must be corrected to assure the continued performance of this dam. Generally, the dam is considered to be in fair condition. There is no spillway at the site other than overflow at outlet gate A at the dike. There is no permanent mechanism to operate the gate at outlet B at the dam. There were several problem areas observed at the site: erosion along the slopes of the dam, irregular and displaced riprap, and the collapsed wall on the upstream face of the dam; leakage around the closed gate of outlet B; seepage in the tailrace downstream of the dam; and overgrowth of vegetation on the dam, the dike, and over the discharge channel from the spillway.

Hydraulic analyses indicate that the outlet structure at the dike, which serves as a spill-way can discharge a flow of 180 cfs when the gate is fully opened and the water surface is at El 519 (the low point on the dam). This means that the outlet is adequate for only 7 percent of the test outflow of 2,650 cfs.

- b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented

by the Owner within 2 years after receipt of this Phase I Inspection Report.

- d. Need for Additional Investigations.

 Additional investigations to further assess the adequacy of the dam are outlined below in Section 7.2. Recommendations.
- 7.2 Recommendations. In view of the concerns over the continued performance of the dam, dike, and outlet works it is recommended that the Owner employ a qualified consultant to:
 - Conduct a more detailed hydrologic and hydraulic investigation to design an adequate spillway.

The recommendations on repairs and maintenance procedures are outlined below under Section 7.3, Remedial Measures.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. The dam and appurtenance structures are not adequately maintained. It is recommended that the Owner accomplish the following:
 - (1) construct a permanent operating mechanism for opening the gate on the low-level outlet at the dam (Outlet B).
 - (2) repair the leak through the gate, and the spalled concrete at Outlet B.
 - (3) repair the riprap and erosion on the upstream face of the dam and clear the vegetation.
 - (4) repair the stone walls in the approach channel, and the railing on the walkway at Outlet A.
 - (5) clear the trees and vegetation on the dike and along the outlet channel.
 - (6) implement a systematic program of maintenance inspections. As a minimum, the program should consist of a monthly inspection of the dam and appurtenances,

supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in accordance with all applicable State regulations.

- (7) institute a definite plan for surveillance and a warning system during periods of unusually heavy rains and/or runoff.
- (8) Technical inspections of this dam should be conducted on an annual basis.
- 7.4 Alternatives. An alternative to implementing the recommendations and maintenance procedures listed above would be to drain the pond and breach or remove the dam.

APPENDIX A PERIODIC INSPECTION CHECKLIST

PERIODIC INSPECTION PARTY ORGANIZATION

TIME 1:30 to 5:00 pm WEATHER SUNNY, 80° F W.S. ELEV. 517.0 U.S. — DIV. PARTY: 1. Ed Greco 6. Frank Sviokla 2. Lyle Branagan 7. Henry Lord 3. Sue Pierce 8. 4. Carol Sweet 9.
W.S. ELEV. 517.0 U.S. TON. STARTY: 1. Ed Greco 6. Frank Sviokla 2. Lyle Branagan 7. Henry Lord 3. Sue Pierce 8. 4. Carol Sweet 9.
PARTY: 1. Ed Greco 6. Frank Sviokla 2. Lyle Branagan 7. Henry Lord 3. Sue Pierce 8. 4. Carol Sweet 9.
1. Ed Greco 6. Frank Sviokla 2. Lyle Branagan 7. Henry Lord 3. Sue Pierce 8. 4. Carol Sweet 9.
2. Lyle Branagan 7. Henry Lord 3. Sue Pierce 8. 4. Carol Sweet 9.
1. Carol Sweet 9.
1. Carol Sweet 9.
4. Carol Sweet 9.
6. David Cole 10.
PROJECT FEATURE INSPECTED BY REMARKS
1. Dam / Diki Ed Greve / Sue Pierce
. Spillway Ecl Greco Lyle Branagan
· · · · · · · · · · · · · · · · · · ·
4
5.
6.
7.
0.
10.

PROJECT FEATURE Dam NAME E. Greco DISCIPLINE Gratennical NAME AREA EVALUATED CONDITIONS DAM EMBANKMENT top of dam is West Main Road Crest Elevation Surrent Pool Elevation 517.0 Maximum Impoundment to Date unknown Durface Cracks none Pavement Condition pavement on West Main Road Movement or Settlement of Crest none Lateral Movement none downstream face is concrete and industrial building and industrial	
AREA EVALUATED DAM EMBANKMENT Crest Elevation Surrent Pool Elevation Surface Cracks Pavement Condition Movement or Settlement of Crest Lateral Movement Vertical Alignment Condition at Abutment and at Soncrete Structures Indications of Movement of Structural Items on Slopes Trespassing on Slopes Trespassing or Erosion of Slopes or Abutment: Book Slope Protection - Riprap Failures Unusual Embankment or Downstream for top of dam is West Main Read top of dam is designed top of dam is dest for one. Top of dam is designed top of dam is designed top	
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Sloughing or Erosion of Slopes or Abutments Rock Slope Protection - Riprap Failures Unusual Movement or Cracking at or near Toes Unusual Embankment or Downstream seepage in tailrace, behind miles	
Unusual Movement or Cracking at or near Toes Unusual Embankment or Downstream seepage in tailrace, behind mile	
Or near Toes nut inspected inside Unusual Embankment or Downstream seepage in tailrace, behind mil	A(* E
	building
Seepage building	ગાં!
Piping or Boils none visible	
Foundation Drainage Features none visible	
Toe prains none visible	
Instrumentation System none page A:2 of 5	

DATE 8-23-78
NAME E. Greco
NAME

AREA EVALUATED	CONDITION						
DIKE EMBANKMENT	4 to 5 feet high, located at						
Crest Elevation	east end of pand						
Current Pool Elevation							
Maximum Impoundment to Date	unknasa						
Surface Cracks	none visible						
Pavement Condition	footpath - earth						
Movement or Settlement of Crest	none apparent						
Lateral Movement	none						
Vertical Alignment	relatively flat						
Horizontal Alignment	relatively straight						
Condition at Abutment and at Concrete Structures	cabana at east abutment natural ground at west abutment						
Indications of Movement of Structural Items on Slopes	none						
Trespassing on Slopes	footpath on crest						
Sloughing or Erosion of Slopes or Abutments	grass on slopes and crest minor crosion						
Rock Slope Protection - Riprap Failures	stone wall on cipstream face near spillway, then ripiap						
Unusual Movement or Cracking at or near Toes	none						
Unusual Embankment or Downstream Seepage	none visible						
Piping or Boils	none apparent						
Foundation Drainage Features	none						
Toe Drains	none						
Instrumentation System	none						

PROJECT Brierly Pand	DATE 8-23-78
PROJECT FEATURE Outlet works	NAME E Greco
DISCIPLINE <u>Crotecnoical</u>	NAME
AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Concrete and stone masanry
a. Approach Channel	submerged
Slope Conditions	/
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	/
b. Intake Structure *	concrete U-shaped headwall
Condition of Concrete	fair-erosion and spalling
Stop Logs and Slots	wooden stide gite with eyebolt no control meghanism
	rutten wood in keywaij scund of running water indirectes that gate is leaking
	Outlet pipe enters claustream mill building, aischarges into claunstream tailrace. Inside of building not inspected.

* An abandoned intake structure for waterwheel is located 30 ft. from upstream face, perpendicular to outlet gate intake Pensteek is filled in with concrete.

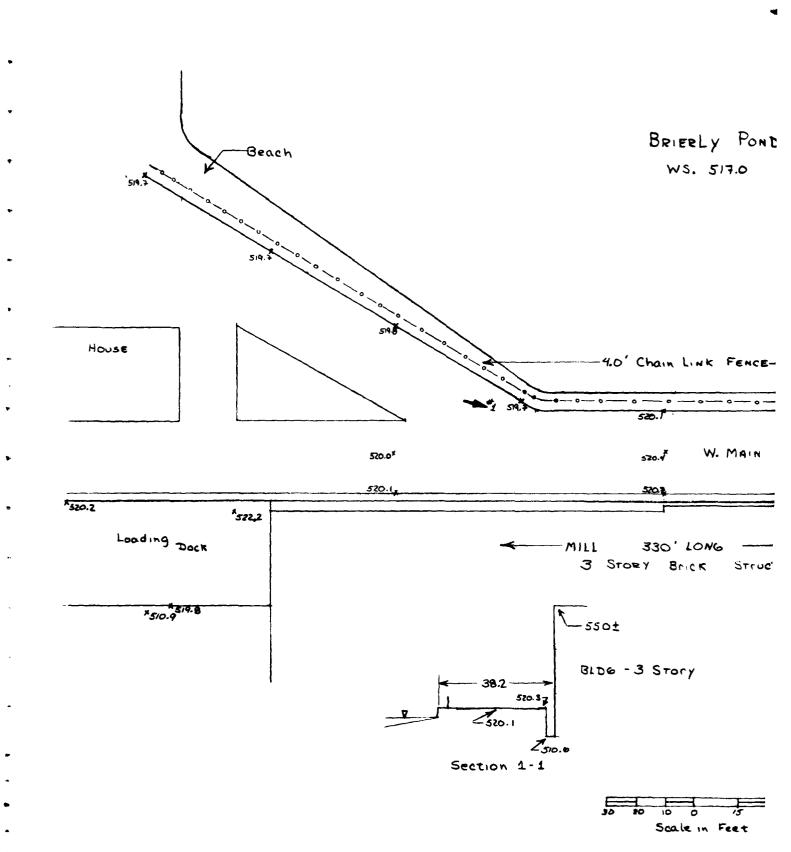
PROJECT Briefly Pond	DATE 8-23-78
PROJECT FEATURE Spillway	NAME E Greco
DISCIPLINE Hydraulic	NAME L. Branagan
AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	mortared stone masonly and concrete wall
General Condition	good to fair: mortar and concrete missing
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	1-12" and 1-24" tree adjacent to approach
Floor of Approach Channel	Submerged
b. Weir and Training Walls *	concrete walls
General Condition of Concrete	fair: some erosion and deterioration
Rust or Staining	none
Spalling	minor
Any Visible Reinforcing	none
Any Seepage or Efflorescence	none
Drain Holes	none
c. Discharge Channel	
General Condition	good to fair
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	numerous trees and bushes
Floor of Channel	possibly lined with stones
Other Obstructions	stane walking downsmean, also partial diversion to community cessood

^{*} Slide gate mechanism operated by rack and pinion keyway for flashboards above slide gate wooden walkway over channel.

APPENDIX B

PLAN OF DAM AND PREVIOUS INSPECTION REPORTS

	Page
Figure B-1. Plan of Dam and Section	B-1
Figure B-2. Plan of Dike and Outlet	B-2
Previous Inspections (Partial Listing)	B-3
Inspection Reports by Massachusetts Department of Public Works, January, 1972	B - 5



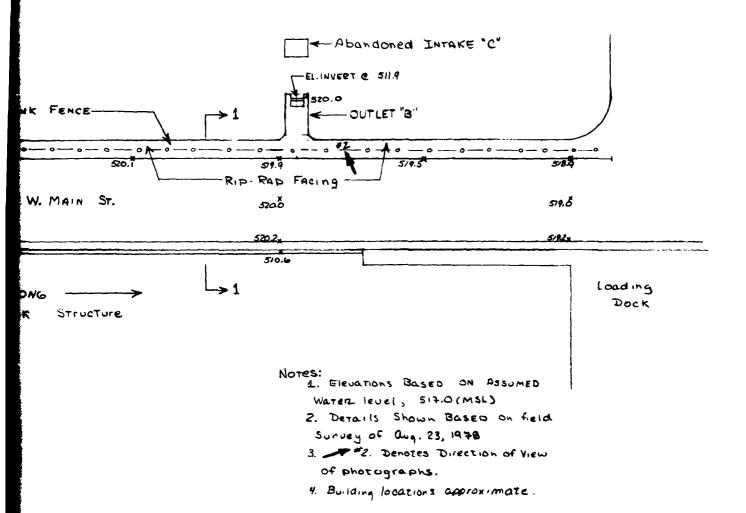
Mercalf & Eddy, Inc.

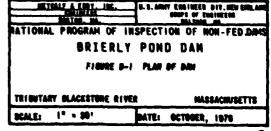


Ly POND 517.0

in Feet

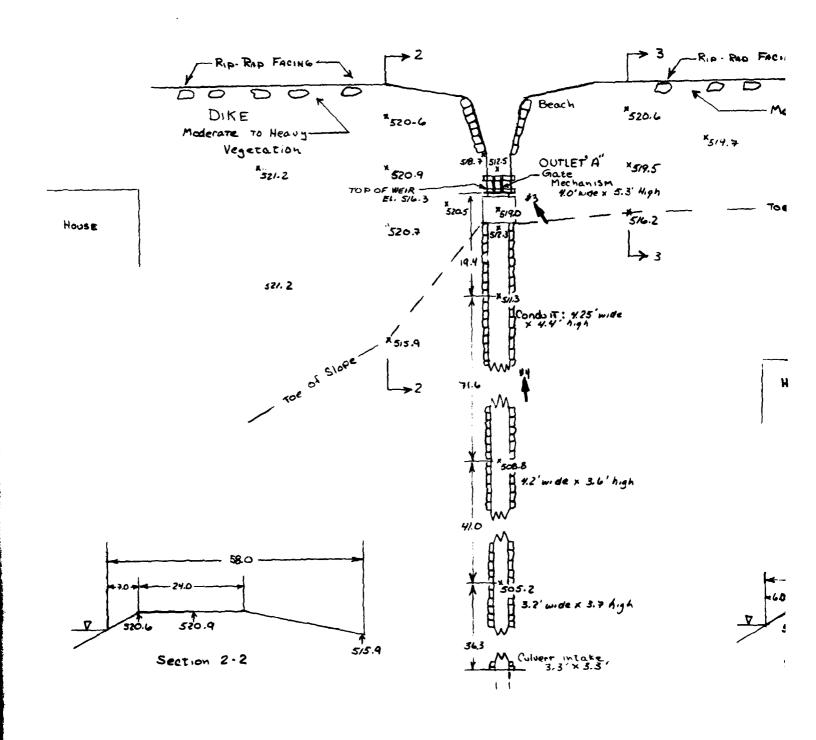
Overview





2

BRIERLY POND WS 517.0



W. MAIN ST. Crown El. 507.8

PROCEDENG PAGE BLANK-NOT FILLIGHD



House

NOTES:

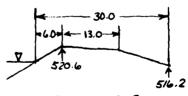
1. Elevations shown are referenced to assumed water level 517.0 (MSL)

2. Details shown from field survey aug 23, 1978

3. _____ * Shows direction of Unew of photographs

4. Building locations approximate





Section 3-3

METCALF & EDGY, INC. FREINEER GRATON, MA.	U. S. ARMY ERGINEER DIV. HEN ENGLAN COMPS OF ENGINEERS
	SPECTION OF NON-FED. DAMS
BRIERLY F	OND DAM
FIGURE 8-2 PLAN OF BI	KE AND OUTLET WORKS
TRIBUTARY BLACKSTONE RIVER	MASSACHUSETTS
	BATE: OCTOBER, 1976

2

CITY OR TOWN MILL BORY BRIERLY BULLING	MILLIAMITE POWD NO DAN #186-14A
2	
DESCRIPTION OF DAM	DESCRIPTION OF RESERVOIR + WATERSHED
TYPE	MAIN STREAM SLUGLETHAY BEOOK
Leweth	
MEIGHT	LENETH OFWARESHED
THICKINGS TOP	WIDTH " .
	TS WATERSHED CULTIVATED
DOWN STREAM Stope	PER CENT IN FORCETS
4	STERPHESS OF SLOPE
	KIND OF SAIL
	NO. OF ACRES IN WATERSHED
	" " " KESEKYOIR
MOSTAL MODALPS OX GATES	LENGTH OF RESERVOIR
	MiðTH :: "
"Constructe br	MAR From Guift, PRASEC.
	MEAS OR FLASH BOARDS - LOW WARER
	11 m " - MIGH "
U.S. 6.5. Quap LAT.	LONG,
Owner	FUNCTION OF DAM & REMARKS
W.W. Wimor E Company	
- 65 CANDE ST. MILLBURY	

PREVIOUS INSPECTIONS (PARTIAL LISTING)

COPY OF INSPECTION CARD ON FILE AT THE MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS, DISTRICT OFFICE, WORCESTER.

B-3

22 Peno PLAN NO. Flood DAM NO. 39 14	C. C. DOCKET NO.	DESCRIPTION OF RESERVOIR & WATERSHED	100' Name of Main Stream Singletary Brock	Length of Watershed	Width " "	Is Watershed Cultivated	Percent in Forests	Steepness of Slope	Nind of Soil Kocky		Length of Reservoir	Wigth " "	Max Flow Cu. Ft. per Sec.	Head or Flashboards-Low Water	High .	GENERAL REMARKS	Measured: April 27, 1939-L.H. Sorty- MF. Hunt.		Feb. 1944 . Linen Intead Coulus Milloury.	Now- W. W. WINDLE CO.		•	٠		9-(way buse 16-5750)
TOWN OR CITY MITTOURY DECREE NO. MILL POWD	OCATION Bramanulle so	DESCRIPTION OF DAM	upstream hb !! :	•	one top 'db/ = f6' = crest = emb		edols m	- H	Length of Spilway FY. Crest + 100 5.	٤ ۽	Flushboards used 3 of Bon for 105.5 5-6" wide Yes	Width Flushboards or Gates	Dem designed by	* constructed by	Year constructed	-	West End Thread Go Mill #1	Inspected: Sept 19, 1924, 4.0. Marten.	•		Nov. 15, 1928	" : Sept. 29 1932" " "	25,1935/ " "	May 13 1937 K. M. Finlayson	

	(Pi) 3-14-156-14A
INSPECTION REPORT & DATA FOR DAMS	Dam No Sweet
" THOTTE THE STATE OF THE PARTY	Town: MILLBURY
Owner: W. W. WINDLE COMPANY	Stroam : Single Tony Brook
His Address: IS CANAL ST, MILL BURY Function of Dam: MILLY STORAGE POND	Pond: MILL A-0 Date: 1/27/72
Function of Dam: Mill & Storage Powo	Date: //27/72
Location & Access : Ver Surrow Ry que MA	ONDITION RATING
ACROSS FROM MILL	Structural: (#820 n
USGS Quad. Werc. South Lat. 42 10'32 Long. 7/	46'30" Hydraulic: O
Drain.Ar.: Sq.Mi.; Ponds: ac.; Res.	Scienti in monaretti (200 p
Character of D.A.:	PHIORITY: NOWE
	6.0
Estimated	pr
Discharge_:	Application of the second of t
Capacity:	_ · _ •
General Description of Dam and Discharge	Control:
WEST MAIN ST IS THE DAM	THE CONTROLL OF IS
WATER 4 15 SEALED UP, GHIE	No CONTROLS 4 /3 _
SEALED ALSO	A-A END VIEW DAM
Sketch (Not to Scale):	<u> </u>
	K-90-H MILL
4/	3
14	
•	•
	•
(a)	
	• ,
West GATE	·
TI SATE	1
THE GOAD IS THE	DAM A-A
6 SUSTON RD	
	The same of the sa
Hemarks and Recommendations: MILL	,
	· · · · · · · · · · · · · · · · · · ·
	•
	S
	•
Date By Comment	g a g a subsection of the state
VE	
1/21/72 /23/	
	•

Dam No. 3-14-186-1711

	L'rom)
. DISPECTION REPORT & DATA FOR DAMS	Dam No. 30-14
Owner: W. W. WINDLE COMPANY Ris Address: 65 CANAL ST, MILLBURY, MA Function of Dam: MILL POND	Town: MILLBURY Stream: SNGLETARY BLOOK SS. Pond: BRIERLY FOND Date: 1/27/72
Tocation & Access: 200 W. TIROUGH FIELD JCT OF W. MAIN & BEACH STREETS USGS Quad. Norc. South Lat. 4200 38 Long. 7,0463 Drain. Ar.: 757 Sq. Mi.; Ponds: ac.; Res. Gdam Character of D.A.;	Structural: 6000
Estimated Discharge: Capacity:	
General Description of Dam and Discharge Continue EARTHEN DAM WIR 5' DISCHAR IN GOOD CONDITION, WUMEROU FACE OF DAM.	BE GATE WHICH IS
Sketch (Not to Scale):	A-A END VIEW DAM
N. FLOW	F: #15-7
78-8T	
K 75 - 38 8K 180 - 7	B-B SPILLWAY WI GATE SIDE VIEW
A-A 3.5×3' > 8 8/90'2	The state of the s
Remarks and Recommendations:	BOARDS A V ON A !! CATE ARM
w. MAIN ST	
To 3-14-186-13	,
Date By Comment 1/27/72 Exp	

Dam No. 3-14-186 14

APPENDIX C PHOTOGRAPHS



NO. 1 CREST OF DAM



NO. 2 OUTLETS B AND C AT DAM



NO. 3 SLIDE GATE MECHANISM AND SOUTH END OF DIKE



NO. 4 OUTLET CHANNEL (OUTLET A)

APPENDIX D HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Project Nat. Review of Non Fed. Dams Acct No. 6036 Page 1 01 5

Subject Worcester Mass. Area Comptd. By LEB Date 8/1/78

Detail BRIERLY POND DAM Ckd. By Employ Date 10/9/76

I Test Flood, 100 year storm & Storage Functions

1 - Total Drainage Avea - 4.44 mi

2- Ponds & Swamps - Total Ponds = 0.702
Total Swamps = 0.138

70 Ponds & Swamps = 0.840 = 19 %

3- 849-517 = 1.277% } Say Ave Slope = 3%

4-Using C. of E. Curver for Peak Flow Ruter & above guide values the Peak Flow Rate was estimated to be considerable. lower than "Rolling", and taken at 1200 c.f.s./mi

Due to low dan height use 1/2 MPF

5- Test Flood Inflow = = (1200) 4.44 = 2664 = fs.

6 - Storage:

Brierly Pond has an area of 0.027 miz Singletary Pond has an area of 0.552 miz

Storage perfoot rise in Briefly = 17.3 acre feet ... Singletory = 353,3 acre feet.

(Assume Pond areas remain constant)

7- Storage Functions are based on Pour = Qin[1- Sout]

Sout = Storage Vol. in Reservoir related to find Quit

Sout = Storage Vol. in Resenvoir related to find Gout in terms of inches of rain over the drain agr area

5(m Inches) = 12 D (1027) = 0.073 D & R=6hr rain = 15 --- 1

D = Storage Depth (asses spilling) on resolver in ties

Project Nat. Review of Ubn Fed. Dams Acct. No 6036 Page 2 of 5
Subject Worcester Mass. Area Comptd By LEB Date 7/13/76

Detail BRIERLY POND DAM Ckd By EMG Date 10/9/72

- 1- All discharge over top of small outlet structure50'wide and swale-with similar level-100'wide

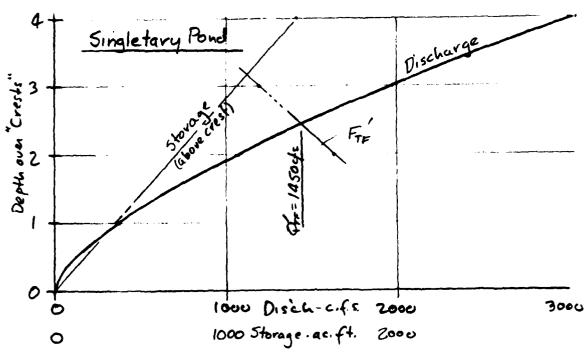
 Use q= 2.55H1.5: Q= 3.82.5H1.5
 - 2 Use P.F.R.slightly higher than Brierly-due to reduced D.A.

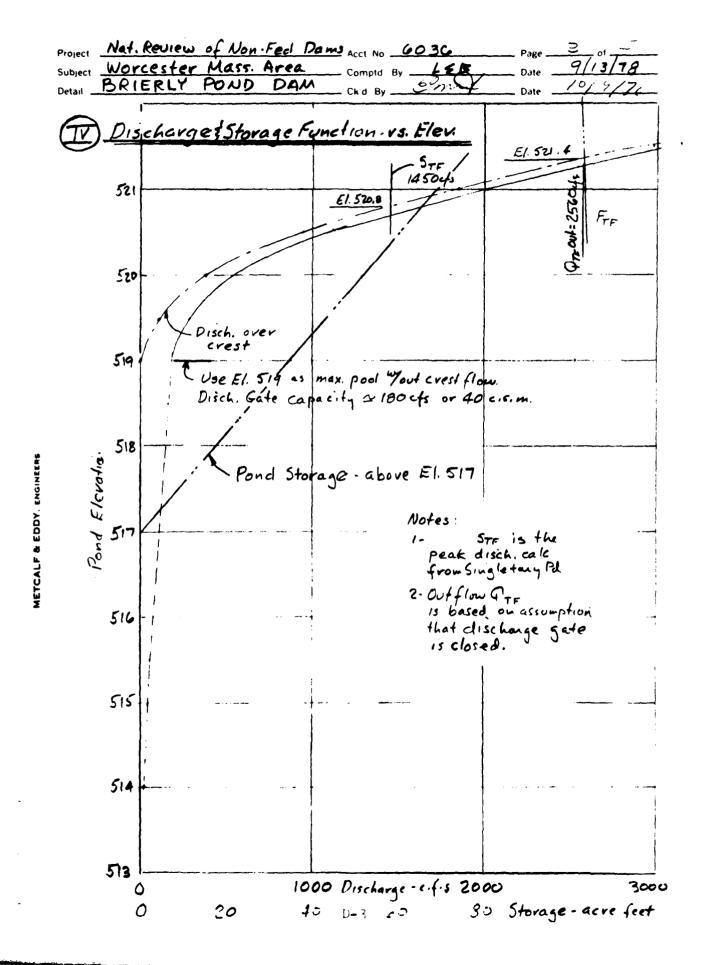
 Test Flood Peak = 1/2 (1250 cfs/mit) 4 mit = 2500c.f.s
 - 3 Storage Function, 1 5=12 D(\frac{155}{4.0}) 1.65D

 FTF: 2500 2635 = 2500 434 D D meac. from top swall

4-
$$H(mD) = 1'$$
 2' 3' 4'
$$Q = 382 | 1082 | 1988 | 3060'$$

$$FT = 2066' | 1632 | 1198 | 764'$$





Project Not. Rev. of Non Fed. Dams Acct No. 6036

Subject Worcester Mass. Area Comptd By LEB Date 9/15/78

Detail BRIERLY POND DAM Ckd. By EME Date 10/9/36

Failure of Dam - with Pond@ El. 519 = - Top of Crarl

Location 1- 170' of "dam" parallel to factory and under Sutton Road. Base of dam taken as elev. 510.6

Pr = 1.68 (.4) 180 (2.8) 1.5 - 570 45

Failure at either location would dischange flow into the former Mayo Pond basin. Mayo Pond is dry and it's "dam" was the base of a factory, but the control aate appears to have been removed to minimize ponding. The dry Mayo Pond would reduce the impact of a Brieving Pond Dan failure on Bramanuille.

II Crest Flow Vel.

Test Flood: El, 521.4 - Max gerest = 2.67 (521.4 - 519) 1.5 = 9.93 cfs/fx.
As Critical Flow: Ye = 1.5', Ve = 6.8 fps

Drawdown Rate

If Disch. Gate was operable, its max disch before overtopping the crest is \$180 e.f.s. or 40 c.s.m. or 770 of Test Flood outflow

Project Nat. Review of Non-Fed. Dams Acct No 6036 Page of 5

Subject Wovcester Mass. Area Comptd By LEB Date 9/13/78

Detail BRIERLY POND DAM Ckid By EMG Date 10/9/76

Dam Discharge Rating

A - Discharge Gate & Chute

Assume Critical Depth (ye) on Crest @ Gate - 48"wide Assume Effective width = 4-0.5' = 3.5' Pond Level = Crest El. + 1.5 Crit. Depth = 512.5+1.5(yc) $Q = 3.5\sqrt{g} (ye)^{1.5} = 20 ye^{1.5}$

ye 1' 2' 3' 4' Q 20' 56 104 1604 Bordél 514.0 515.5 517.0' 518.5

B. Crest & Swale Discharges

Three locations for crest flow. 1-Near Factory, 2-Near discharge gate, 3-5wale at north end of pond.

1-Near Factory 100' @ El. 519 north of fact. & 100' @ El. 520 southing Fact.

2-Near Disch. Gaze Total widths: El. 519± -9', El 519.5-12'

El 520-62' El. 520.5-180'

3-10-100 disciplination of Reach Et. - El. 519.5-100' with

Use g = 2.67 H" [Ref. V.T.Chow-"Open Chan Hydr" Pg 53]

Pond Eli	519.5	5200	520.5	521.0	521.5
1 hoc. i North 5'9	94	267	490	755	1055
3 " 1 South so	. —	-	94	267	490
2 - 2 El. 519-	9' 8 '	24	44 -	68	95
2 11 2 El. 519.5		3	8	15	23
2 El. 520 -	50' —	•	47	133	245
0 , 2: F1.520.5	-118,		-	111	315
" 3 . El. 519.5.		94	207	490	755
Totals	102	388	950	1839	2978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

40EC78 VER/DATE 4 **SC3** z PRV/FED DAY NO YR 200CT78 12100 REPORT DATE POPULATION FED R z (2) MAINTENANCE Z T O LATITUDE LONGITUDE (WEST) 4210,6 7146,5 FROM DAM (MI.) z AUTHORITY FOR INSPECTION • CONSTRUCTION BY 3 1810 85 NED NONE NAME OF MPOUNDMENT PUBLIC LAW 92-367 HVPALAU MPOUNDING CAPACITIES
HEAVY NEEKINY ASSEMPLA INVENTORY OF DAMS IN THE UNITED STATES CNKNONN NEAREST DOWNSTREAM CITY-TOWN-VILLAGE MILLBURY 135 OPERATION ❷ NONE MSPECTION DATE REGULATORY AGENCY 31 AUG 78 10 ENGINEERING BY MARE Θ REMARKS REMARKS ⊚ • (8) BRIERLY POND DAM 3370 CPENDEN CONSTRUCTION VOLUME OF DAM (CY) ◉ PURPOSES RONE RIVER OR STREAM • (0.18 SMLWAY WAY! OSCURATOR 1.08 CM. 1. SINGLETARY BROOK FOPULAR NAME AINDLE INDUSTRIES INC INSPECTION BY METCALF + EDDY, INC. VEAR COMPLETED 1680 1 DWNER • DESIGN TYPE OF DAM AEC 1PG 01 06 ECO PAS TONE **③** #T # Э

